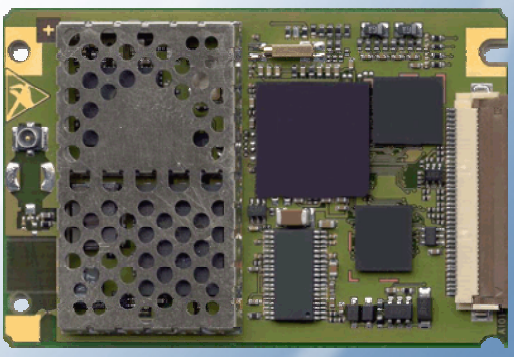
SIEMENS

MC35i

Siemens Cellular Engine



Migration from MC35 to MC35i

Version: 01.03
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Wireless Modules

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0 Document history

Preceding document: “Migration from MC35 to MC35i" Version 01.02
New document: “Migration from MC35 to MC35i" Version **01.03**

Chapter	Page	What is new
All	All	Styles according to ICM WM RD 4 usage, usage of file property fields for product names, of bookmarks for other document data
2.1	10f	Added information regarding PCB thickness, temperature range and power pads
3.1	12	Added new feature: Heat sink
3.2	13	Revised Table 5: Wake up from SLEEP mode
3.3	15	Changed **MC35i** signal names
3.4.1	16	Revised Table 8: Current consumption comparison
0	16	Added information regarding **MC35i** power down scenario.
3.4.3	17	Deleted overvoltage detection feature
3.4.3.1	17	Revised Table 9: Maximum ratings and the associated URCs and added note
3.9	19	Revised mechanical drawings
4.1	21	New features added: AT^SGCONF and AT^SLMS
4.2.7	30	Added parameter for AT^SRTC

Preceding document: "Migration from MC35 to MC35i" " Version 01.01
New document: “Migration from MC35 to MC35i" " Version 01.02

Chapter	Page	What is new
2	10	Updated Table 3: General description b)
3.4.3.1	17	Added information regarding temperature depended shutdown
4	21	Revised Chapter including all tables

Preceding document: "Migration from MC35 to MC35i" Version **01.00**
New document: “Migration from MC35 to MC35i" Version **01.01**

Chapter	Page	What is new
4	21ff	Revised all tables

Preceding document: "Migration from MC35 to MC35i" Version **00.01**
New document: "Migration from MC35 to MC35i" Version **01.00**

Chapter	Page	What is new
Throughout this document: Revised Hardware parameters		

1 General information

1.1 How to use this document

The target audiences for this document are all categories of software and hardware developers, system integrators and expert end-users of SIEMENS GSM wireless modules. The content applies in particular to current users and developers whose applications are utilizing SIEMENS MC35 and MC35i for their communications purposes.
The aim of this document is to provide information and offer support in order to facilitate the transition towards a new generation of SIEMENS wireless modules, MC35i in this case.
Information provided here is based on official technical manuals and released specifications for MC35 and MC35i. The naming conventions used in this document follow those of source documentation.
The authors presume the readers are already familiar with the contents of those manuals. The document presents migration issues in detail using comparison tables between the modules and covers topics ranging from hardware specifications to AT-command interface.
Technical specifications and interfaces to GSM telecom services are described and compared in detail as well as all the relevant features. AT-command interface was given particular attention since it represents the main tool available to developers through which applications can be controlled. Available commands for both MC35 and MC35i are listed and classified according to their implementation within each of the modules. Differences in test, query and execution syntax as well as in available parameters are noted for each command. Commands are classified in three main groups: jointly supported commands, MC35i commands that are new with respect to MC35 and MC35i commands not supported by MC35.

1.2 Related documents

[1] MC35 Hardware Interface Description
[2] MC35 AT Command Set
[3] MC35i Hardware Interface Description
[4] MC35i AT Command Set
[5] GPRS Startup User's Guide
[6] Remote-SAT User's Guide
[7] Multiplexer User's Guide
[8] Multiplex Driver Developer’s Guide for Windows 2000 and Windows XP
[9] Multiplex Driver Installation Guide for Windows 2000 and Windows XP
[10] DSB35 Support Box - Evaluation Kit for Siemens Cellular Engines
[11] Application Note 14: Audio and Battery Parameter Download (in preparation)

1.3 Terms and abbreviations

Table 1*: Glossary of terms*

Abbreviation	Description
ADC	Analog-to-Digital Converter
AFC	Automatic Frequency Control
AGC	Automatic Gain Control
ARFCN	Absolute Radio Frequency Channel Number
ARP	Antenna Reference Point
ASIC	Application Specific Integrated Circuit
B	Thermistor Constant
BER	Bit Error Rate
BTS	Base Transceiver Station
CB or CBM	Cell Broadcast Message
CE	Conformité Européene (European Conformity)
CHAP	Challenge Handshake Authentication Protocol
CPU	Central Processing Unit
CS	Coding Scheme
CSD	Circuit Switched Data
CTS	Clear to Send
DAC	Digital-to-Analog Converter
dBm0	Digital level, 3.14dBm0 corresponds to full scale, see ITU G.711, A-law
DCE	Data Communication Equipment (typically modems, e.g. Siemens GSM engine)
DCS 1800	Digital Cellular System, also referred to as PCN
DRX	Discontinuous Reception
DSB	Development Support Box
DSP	Digital Signal Processor
DSR	Data Set Ready
DTE	Data Terminal Equipment (typically computer, terminal, printer or, for example, GSM application)
DTR	Data Terminal Ready
DTX	Discontinuous Transmission
EFR	Enhanced Full Rate
EGSM	Enhanced GSM
EMC	Electromagnetic Compatibility
ESD	Electrostatic Discharge
ETS	European Telecommunication Standard
FDMA	Frequency Division Multiple Access
FFC	Flat Flexible Cable
FR	Full Rate
GMSK	Gaussian Minimum Shift Keying
GPRS	General Packet Radio Service
GSM	Global Standard for Mobile Communications
HiZ	High Impedance
HR	Half Rate
I/O	Input/Output
IC	Integrated Circuit

Abbreviation	Description
IMEI	International Mobile Equipment Identity
ISO	International Standards Organization
ITU	International Telecommunications Union
kbps	kbits per second
LED	Light Emitting Diode
Li-Ion	Lithium-Ion
Mbps	Mbits per second
MMI	Man Machine Interface
MO	Mobile Originated
MS	Mobile Station (GSM engine), also referred to as TE
MSISDN	Mobile Station International ISDN number
MT	Mobile Terminated
NTC	Negative Temperature Coefficient
PAP	Password Authentication Protocol
PBCCH	Packet Switched Broadcast Control Channel
PCB	Printed Circuit Board
PCL	Power Control Level
PCN	Personal Communications Network, also referred to as DCS 1800
PCS	Personal Communication System
PDU	Protocol Data Unit
PLL	Phase Locked Loop
PPP	Point-to-point protocol
PSU	Power Supply Unit
R&TTE	Radio and Telecommunication Terminal Equipment
RAM	Random Access Memory
RF	Radio Frequency
RMS	Root Mean Square (value)
ROM	Read-only Memory
RTC	Real Time Clock
Rx	Receive Direction
SAR	Specific Absorption Rate
SELV	Safety Extra Low Voltage
SIM	Subscriber Identification Module
SMS	Short Message Service
SRAM	Static Random Access Memory
TA	Terminal adapter (e.g. GSM engine)
TDMA	Time Division Multiple Access
TE	Terminal Equipment, also referred to as DTE
Tx	Transmit Direction
UART	Universal asynchronous receiver-transmitter
URC	Unsolicited Result Code
USSD	Unstructured Supplementary Service Data
VSWR	Voltage Standing Wave Ratio
ZIF	Zero Insertion Force
FD	SIM fixdialling phonebook
LD	SIM last dialling phonebook (list of numbers most recently dialed)
MC	Mobile Equipment list of unanswered MT calls (missed calls)

Abbreviation	Description
ME	Mobile Equipment phonebook
ON	Own numbers (MSISDNs) stored on SIM or ME
RC	Mobile Equipment list of received calls
SM	SIM phonebook

2 Feature migration

Feature comparison for both modules introduced in the table below. Only main specifications are listed.

2.1 General description

Table 2: General description a)

Features	Parameter	MC35	MC35i
Product Data	Frequency bands:	Dual-band EGSM 900, GSM1800 compliant to GSM Phase 2/2+	
	Output performance:	Class 4 (2W) for EGSM900 Class 1 (1W) for GSM1800	
	Receiver Sensitivity:	< -102 dBm	
	GSM Class:	small MS	
	Control:	via AT commands	
	Supported SIM card:	3 V	
		External SIM card holder has to be connected via SIM interface connector	
	Phonebook management:	SM, FD, LD, MC, RC, ON, ME	
	Input voltage range:	3.3 – 4.8 V	
		Automatic shutdown supported	
	Component mounting:	both sides	single-side mounted
	Dimensions:	54.5 x 36 x 6.65 mm	54,50 x 36 x 3,6 mm
	PCB Thickness :	1.25 mm	0.85 mm
	Weight:	16 g	9 g
	Temperature range	-25°C to +55°C (normal operation)	-20°C to +55°C (normal operation)
	Automatic shutdown	-29°C to -25°C +55°C to 70°C (restricted operation)	-25°C to -20°C +55°C to 70°C (restricted operation)
		(>+70°C and <-29°C)	(>+70°C and <-25°C)
		-40°C to +85C (storage)	
	Battery Charging:	Supported	Not supported
	Real time clock:	Implemented	
	Timer function:	Programmable via AT command	
	Antenna design:	50Ω antenna interface.	
	Antenna connectors:	GSC coaxial connector	
	Evaluation kit	DSB 35 Support Box	
	SIM Application Toolkit	Supported	
Audio	Speech codec:	Half Rate (ETS 06.20)	
		Full Rate (ETS 06.10)	
		Enhanced Full Rate (ETS 06.50 / 06.60 / 06.80)	
	Audio interface:	2 x analogue audio interfaces (hands-free, supports echo cancellation)	
SMS	General:	Point-to-point MT and MO SMS	
		SMS Cell Broadcast	
		Text and PDU mode SMS MO	
	Transmission of SMS:	Over CSD or GPRS connections. Preferred mode can be user-defined.	
	SMS storages	SIM card plus 25 SMS locations in the mobile equipment	

Table 3: General description b)

Features	Parameter	MC35	MC35i
Data	Supported services	2400 bps (V.22bis) 4800 bps (V.32) 9600 bps (V.32) 14400 bps (V.34) 2400 bps (V.110) 4800 bps (V.110) 9600 bps (V.110) 14400 bps (V.110)	
	USSD support	Supported	
	Connection element	non-transparent mode	
	Autobauding	supported	
Fax	Supported classes	Group 3: Class 1, Class 2	
GPRS	Connectivity	GPRS multi-slot class 8 GPRS mobile station class B	
	Data downlink transfer	max. 85.6 kbps	
	Data uplink transfer	max. 21.4 kbps	
	Coding scheme	CS-1, CS-2, CS-3 and CS-4	
	PAP (Password Authentication Protocol)	Supported	
	Challenge Handshake Authentication Protocol	Supported	
	Packet Switched Broadcast Control Channel (PBCCH)	Supported	
External interfaces	RF interface:	GSC antenna connector only	
	Power:	3 additional power pads available	2 additional power pads available
	Application interface:	40-pin ZIF connector	
Serial interface	Supported Baud rate:	300bps…115kbps	300bps…230kbps
	Autobauding:	1.2kbps…115kbps	1.2kbps…230kbps
	Local character framing:	8N1- fixed	
	Multiplex mode:	Supported	
	Flow control:	RTS/CTS hardware handshake and software XON/XOFF flow control.	
Software update	Via serial interface and SIM interface		

2.2 Certification and standards

Both MC35 and MC35i comply with the same directives and standards listed in [1] and [3]. However, please note that a new R&TTE approval of the host application is required after migration from MC35 to MC35i.

3 Hardware migration

This chapter contains information about the hardware design, installation instructions as well as physical properties for both modules. Hardware features are listed in comparison tables related to power supply, RF, audio, SIM and serial interfaces with functionality descriptions. All features, except RF, are available through common host application interface.

3.1 Introduction

MC35i incorporates almost all of the MC35 features like EGSM 900MHz, DCS 1800MHz and fast GPRS technology with following additional features:

- **Autobauding up to 230kBaud**
- **Single side mounted**
- **Two additional Sleep Modes**
- **Place for attaching a heat sink to the ground pad on the bottom of the module** (Please note that the heat sink should not cover the test points shown in Figure 2)

MC35i is super-slim, single-side mounted, compact, dual-band GSM/GPRS OEM module for integration into industrial or mobile devices. Designed to easily provide radio connection for voice and data transmission it integrates seamlessly with a wide range of GSM/GPRS application platforms and is ideally suited to design and set up innovative cellular solutions with minimum effort.

MC35i and MC35 are supporting GPRS multi-slot class 8 (4 Rx, 1 Tx time-slot) and the GPRS coding schemes CS-1, CS-2, CS-3 and CS-4. Modules operate in GSM 900MHz and GSM 1800MHz frequency bands.

3.2 Operating modes

The operating modes for MC35 and MC35i modules are listed in the table below.
The MC35i module supports two additional sleep modes compared to MC35.
For further details please consult the MC35i manual.
The table below shows operating modes overview for both devices.

Table 4: Operating modes

Mode	Function	MC35	MC35i
Normal operation	GSM / GPRS SLEEP	Power-save modes set with AT+CFUN command. Software is active to minimum extent. If the module was registered to the GSM network in IDLE mode, it is registered and paging with the BTS in SLEEP mode, too. Power saving can be chosen at different levels: The NON-CYCLIC SLEEP mode (AT+CFUN=0) disables the AT interface. The two CYCLIC SLEEP modes AT+CFUN=5 or 6 alternate activating and deactivating the AT interface to allow permanent access to all AT commands.	Software is active to a minimum extent. If the module was registered to a GSM network in IDLE mode, it remains, in SLEEP mode, registered and pageable from the BTS. Power saving can be chosen at different levels. The NON_CYCLIC SLEEP mode (AT+CFUN=0) disables the AT interface. **The CYCLIC SLEEP mode AT+CFUN=5, 6, 7 and 8** alternatingly activate and deactivate the AT interface to allow permanent access to all AT commands.
	GSM IDLE	Software is active. Once registered to the GSM network, paging with BTS is carried out. The module is ready to send and receive.	
	GSM TALK	Connection between two subscribers is in progress. Power consumption depends on network coverage individual settings, such as DTX off/on, FR/EFR/HR, hopping sequences, antenna.	
	GPRS IDLE	Module is ready for GPRS data transfer, but no data is currently sent or received. Power consumption depends on network settings and GPRS configuration (e.g. multislot settings).	
	GPRS DATA	GPRS data transfer in progress. Power consumption depends on network settings (e.g. power control level), uplink / downlink data rates and GPRS configuration (e.g. used multislot settings).	
POWER DOWN		Operating voltage is applied. Only a voltage regulator in the Power Supply ASIC is active for powering the RTC. Software is not active. The serial interface is not accessible.	
Alarm mode		Restricted operation launched by RTC alert function while the module is in Power Down mode. Module will not be registered to GSM network. Limited number of AT commands is accessible. If application is battery powered: No charging functionality in Alarm mode **MC35** only)	
Charge-only mode		Limited operation for battery powered applications. Enables charging while engine is detached from GSM network. Limited number of AT commands is accessible. There are several ways to launch Charge-only mode: From Power Down mode: Connect charger to POWER lines when engine was powered down by AT^SMSO. From Normal mode: Connect charger to POWER lines, then enter AT^SMSO	**Not supported**
Charge mode during normal operation		Normal operation (SLEEP, IDLE, TALK, GPRS IDLE, GPRS, DATA) and charging running in parallel. Charge mode changes to Charge-only mode when the module is powered down before charging has been completed.	**Not supported**

The Table 5 shows which conditions will wake up MC35 and MC35i from sleep mode
As shown in the following table, MC35i supports two additional sleep modes (7 and 8).

Table 5: Wake up from SLEEP mode

Event	AT+CFUN=0 ⇒ AT+CFUN=1	AT+CFUN=5 or 6 ⇒ AT+CFUN=1	MC35i only AT+CFUN=7 or 8 ⇒ AT+CFUN=1
Ignition line	No	No	No
/RTS0 or /RTS1 (falling edge)	Yes	No	No
Unsolicited Result Code (URC)	Yes	Yes	No
Incoming voice or data call	Yes	Yes	No
Any AT command (incl. outgoing voice or data call, outgoing SMS)	Not Possible (UART disabled)	No	No
Incoming SMS depending on mode selected by AT+CNMI: AT+CNMI=0,0 (= default, no indication of received SMS) AT+CNMI=1,1 (= displays URC upon receipt of SMS)	No Yes	No Yes	No No
GPRS data transfer	Not Possible (UART disabled)	No	No
RTC alarm	Yes	Yes	No
AT+CFUN=1	Not Possible (UART disabled)	Yes	Yes

3.3 MC35 / MC35i – interface and connector comparison

MC35 and MC35i are equipped with a 40-pin 0.5mm pitch ZIF connector that connects to the cellular application platform. ***The ZIF connector is physically the same for both devices***. ***MC35 and MC35i are PIN compatible, with the exception of the pins POWER and ACCU_TEMP. Furthermore it should be noted that some of the MC35 signal names were changed as well as MC35i does not support the charging functionality.***
The host interface incorporates several sub-interfaces described in the following chapters.

Table 6 gives a brief overview of the PIN assignment.

Table 6: Host interface PIN assignment - ZIF connector

Pin No.	Function	IO	Signal Name	
			MC35	MC35i
1-5	Power supply	I	VBATT+	BATT+
6-10	Ground	Ground	GND	GND
11-12	Charger	I	POWER	POWER* - do not use
13	External supply voltage	O	VDD	VDD
14	Battery Temperature	I	ACCU_TEMP	not connected *
15	Ignition	I	/IGT	/IGT
16	Serial Interface	O	/DSR0	/DSR0
17	Serial Interface	O	/RING	/RING0
18	Serial Interface	O	/RxD0	/RxD0
19	Serial Interface	I	/TxD0	/TxD0
20	Serial Interface	O	/CTS0	/CTS0
21	Serial Interface	I	/RTS0	/RTS0
22	Serial Interface	I	/DTR0	/DTR0
23	Serial Interface	0	/DCD0	/DCD0
24	SIM	I	CCIN	CCIN
25	SIM	O	CCRST	CCRST
26	SIM	IO	CCIO	CCIO
27	SIM	O	CCCLK	CCCLK
28	SIM	O	CCVCC	CCVCC
29	SIM	Ground	CCGND	CCGND
30	RTC Backup	I/O	VDDLP	VDDLP
31	Power Down	I	/PD	/EMERGOFF
32	Synchronization	O	SYNC	SYNC
33	Audio	O	EPP2	EPP2
34	Audio	O	EPN2	EPN2
35	Audio	O	EPP1	EPP1
36	Audio	O	EPN1	EPN1
37	Audio	I	MICP1	MICP1
38	Audio	I	MICN1	MICN1
39	Audio	I	MICP2	MICP2
40	Audio	I	MICN2	MICN2

* MC35i supports no battery charging functionality

3.4 Power supply

3.4.1 General

MC35 and MC35i need to connect the power supply to the ZIF connector (5 pins each V_{BATT+} and GND). Power supply has to be a single voltage source at BATT+.
The Power Supply ASIC handles all the key functions for supplying power.
The following tables show an overview of main power supply points with MC35 and MC35i.

Table 7: Power supply signals

General Feature	MC35	MC35i
Ignition (/IGT): This line must be driven low by an Open Drain or Open Collector driver	R_{pullup} = 200kΩ. $V_{low,max}$ = 0.45V @ I_{out} = 10µA	R_{pullup} ~ 100kΩ, C_I ~ 1nF $V_{low,max}$ = 0.5V @ I_{out} = 20µA
	t_{low} ≈ 100ms Signal: falling edge and hold for t_{low} Active Low ≥ 3.2s ON ~~~|____|~~~ Active Low ≥ 3.2s	
Power saving:	Supported through AT+CFUN Functionality levels <fun>=0, 5 or 6	Supported through AT+CFUN Functionality levels <fun>=0, 5, 6, 7 and 8
Emergency shut down: *) (Pin 31 – Signal name "/PD" at **MC35** and "/EMERGOFF" at **MC35i**, see note below.)	$V_{in,low,max}$ = 0.45V @ I = -0.1mA R_I ≈22kΩ $V_{Open,max}$ = 2.25V Watchdog output: $V_{out,low}$ = 0.35V @ 0.01mA $V_{out,high}$ = 2.25V @ -0.01mA $f_{out,\ min}$ = 0.16Hz $f_{out,\ max}$ = 1.55Hz ~~~|____|~~~ Active Low ≥ 3.2s	

*) Note: It is strongly recommended to use this function only in case of emergency. Therefore the signal has been renamed from "Power Down" at the **MC35** to "Emergency Shut Down" at the **MC35i**.

Table 8: Current consumption comparison

Current consumption (typical)							
Device	**Talk mode (during TX burst)**	**Talk mode (average)**	**IDLE mode**	**IDLE GPRS mode**	**DATA GPRS mode**	**SLEEP mode (depending on network configuration)**	**Power Down mode**
MC35	< 2A	300mA	15mA	15mA	360mA	3mA	50µA
MC35i	<2A	300mA	25mA	25mA	360mA	3mA	50µA

3.4.2 Power up / down scenarios

MC35 and MC35i are identical regarding the power up/down scenario, but only MC35 can be activated using the POWER lines.

3.4.3 Automatic shutdown

To ensure proper operation of all assemblies under varying conditions, such as temperature, input voltage, transmission power etc., MC35 and MC35i features protection elements for automatic shutdown.
Automatic shutdown takes effect if:

- the MC35/MC35i board is exceeding the critical limits of overtemperature or undertemperature
- the battery is exceeding the critical limits of overtemperature or undertemperature (MC35 only)
- undervoltage is detected

3.4.3.1 Temperature dependent shutdown

The board temperature is constantly monitored by an internal NTC resistor located on the PCB. The values detected by NTC resistor are measured directly on the board and are therefore not fully identical with the ambient temperature.

Table 9: Maximum ratings and the associated URCs

Sending temperature alert (15 s after start-up, otherwise only if URC presentation enabled)		
	MC35	**MC35i**
^SCTM_A: 1	Caution: T_{amb} of battery between +56°C and +60°C.	Not applicable
^SCTM_B: 1	Caution: T_{amb} of board between +65°C and +70°C.	Caution: T_{amb} of board close to overtemperature limit.
^SCTM_A: -1	Caution: T_{amb} of battery between -14°C and –18°C.	Not applicable
^SCTM_B: -1	Caution: T_{amb} of board between –26°C and –29°C.	Caution: T_{amb} of board close to undertemperature limit.
^SCTM_A: 0	Battery back to uncritical temperature range	Not applicable
^SCTM_B: 0	Board back to uncritical temperature range.	
Automatic shutdown (URC appears no matter whether or not presentation was enabled)		
^SCTM_A: 2	Alert: T_{amb} of battery $\geq$60°C. MC35 switches off immediately.	Not applicable
^SCTM_B: 2	Alert: T_{amb} of board $\geq$70°C. MC35 switches off immediately.	Alert: T_{amb} of board $\geq$70°C. MC35i switches off immediately. [1)]
^SCTM_A: -2	Alert: T_{amb} of battery < -18°C. MC35 switches off immediately	Not applicable
^SCTM_B: -2	Alert: T_{amb} of board $\leq$-29°C. MC35 switches off immediately.	Alert: T_{amb} of board $\leq$-25°C. MC35i switches off immediately. [1)]

[1)] Due to temperature measurement uncertainty, a tolerance of ± 3°C on the switching thresholds may occur.

3.4.3.2 Battery pack

MC35i has no charging management for external batteries.

3.5 RTC backup

MC35 and MC35i are fully identical regarding the internal Real Time Clock.

3.6 Control signals

Input and Output control signals are identical with both MC35 and MC35i device, except for POWER and ACCU_TEMP.

3.7 Interfaces

MC35 ***and MC35i interfaces are compatible***. Detailed comparison values for each interface can be found in the following chapters. For further information please consult [3].

3.7.1 Serial interface

Each device uses the same serial interface with identical pin positions as described in [1], [3].

3.7.2 SIM card interface

There are no changes on the integrated SIM interface with MC35 and MC35i.

3.7.3 Antenna interface

There are no changes on the RF antenna interface with MC35 and MC35i.
Due to different hardware platforms minor changes might be necessary to improve for example current consumption or harmonics.

3.7.4 Audio interface

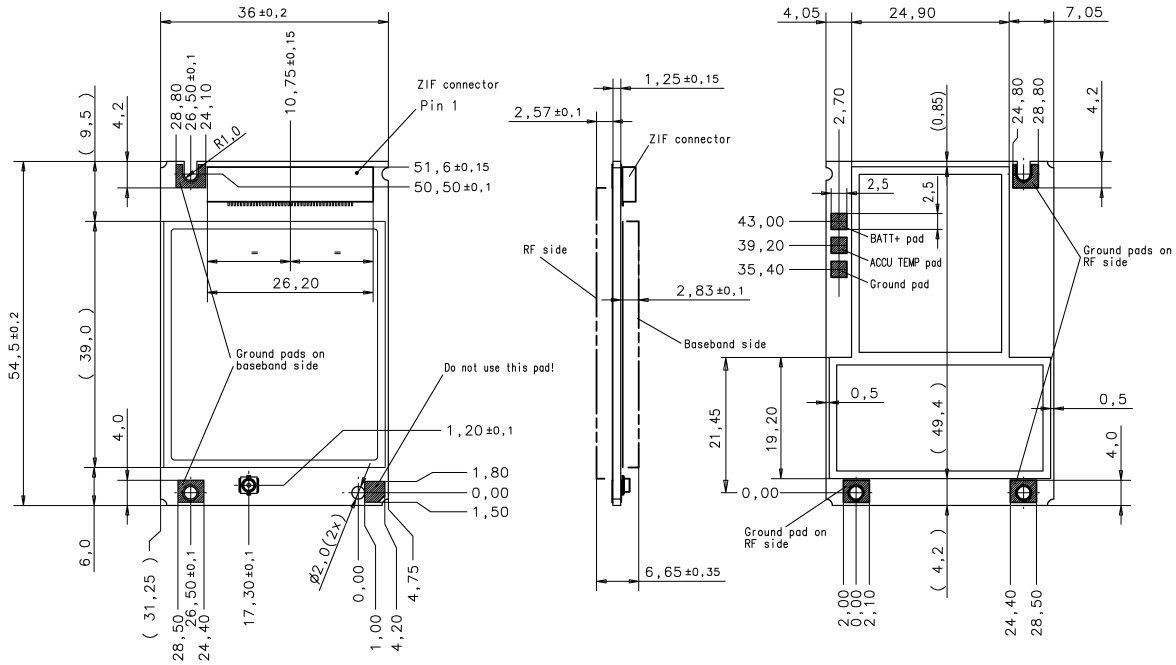
Both MC35 and MC35i comprise two analogue audio interfaces, each with an analogue microphone input and an analogue loudspeaker output.
To suit several types of equipment, there are several audio modes available which can be selected with the AT^SNFS command. The electrical characteristics of the voiceband part vary with the audio mode. For example, sending and receiving amplification, sidetone paths, noise suppression etc. depend on the selected mode and can be set with AT commands (except for mode 1).
All analogue microphone inputs and loudspeaker outputs are balanced. A power supply for electret microphones is implemented in both interfaces, too. If not needed, they have to be decoupled with capacitors.
MC35i only: Independently of the audio mode, analogue interfaces 1 or 2 can be selected and configured by AT commands.
Detailed instructions on using AT commands are presented in the AT Command Set.
The specification of the audio interface signals and the voice band characteristics are identical for MC35 and MC35i. For details refer to the Hardware Interface Description.

3.8 Electrical discharge

MC35 and MC35i are identically protected against electrical discharge.

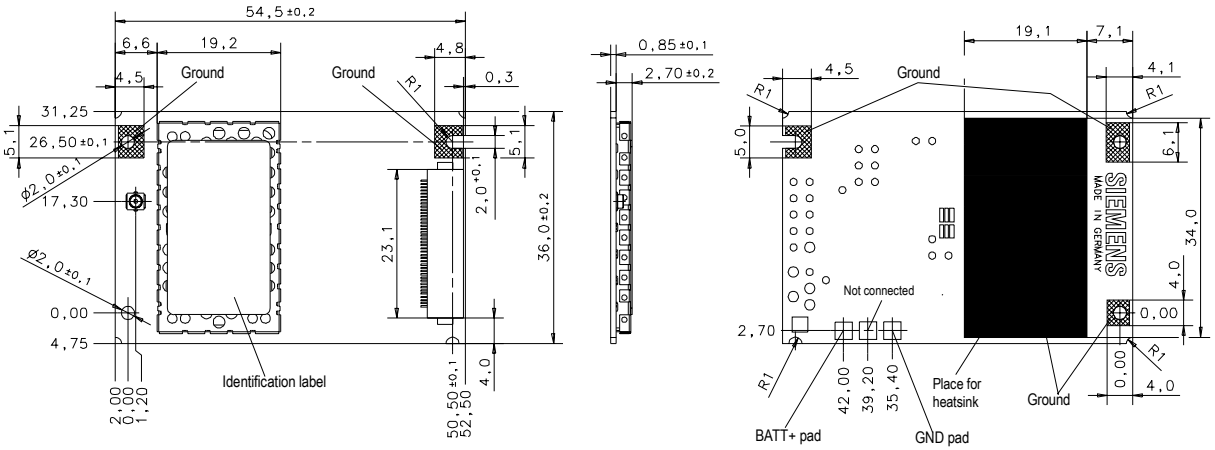
3.9 Mechanical dimensions

MC35 and MC35i provide the same type of connectors and mounting holes on the board. The position of mounting holes is identical as with MC35, as well as the order of external connectors. The outline mechanical dimensions are identical with both devices except the height. MC35i is a single side mounted device and is therefore thinner than MC35. Please note that all test points must be electrically isolated to ensure ESD protection
The heat sink shown in Figure 2 should not cover the marked test points. For further information refer to [3].



0,00 = Reference point *All dimensions in millimeter*

Figure 1: Mechanical dimensions of MC35



All dimensions in millimeter

Figure 2: Mechanical dimensions of MC35i

3.10 Mounting and installation

Appropriate installation and mounting to the host housing / enclosure is essential for reliable operation of the GSM engine.

MC35 & MC35i

The MC35i board provides three mounting holes. To properly mount it to the host device you can use M1.6 or M1.8 screws plus suitable washers. The maximum diameter of the screw head, including the washer, must not exceed 4 mm.

To prevent mechanical damage, be careful not to force, bend or twist the GSM engine. Make sure it is positioned flat against the host device.

Avoid placing the MC35i board tightly to the host device. Instead, it is recommended to set the spacers between the module and the host device. If your design approach does not allow for spacers make sure the host device provides an opening for the RF part.

Avoid exerting any pressure on the shielding covers. Contact springs or other components must not be fastened to the covers. In extreme conditions, you run the risk of short-circuit if the cover was damaged or distorted due to pressure. Furthermore, the covers must not be used to apply any solder joints.

For snap in concept please be aware that the MC35i PCB is thinner then the MC35 PCB.

4 AT commands migration

AT Cellular command structure for MC35i incorporates that of MC35 with the added improvements and new features.
Available commands for both MC35i and MC35 are listed and classified according to their implementation within each of the modules. MC35i supports the entire command set of MC35. Differences in test, query and execution syntax as well as in available parameters are noted for each command. Commands are classified in three main groups: jointly supported commands, commands new with respect to MC35 and MC35 commands not supported by MC35i

4.1 General comments

MC35i feature highlights

The commands below are either newly introduced or improvements:

- **AT+CGREG**: GPRS network registration status
  GPRS AT commands in accordance with GSM 07.07
  Command indicates the registration status of the module during a GPRS session.
- **AT^SMONC**: Cell Monitoring
  Siemens defined AT commands for enhanced functions
  Command was re-introduced in MC35i, based on TC35, not available with MC35.
- **AT^SMONG**: GPRS Monitor
  Siemens defined AT commands for enhanced functions
  Will display GPRS specific cell info either on request or periodically
- **AT^SPBD**: Delete the given Phonebook
  Siemens defined AT commands for enhanced functions
  Deletes entire phonebook contents with a single command.
- **AT^SSMSS**: Set Short Message Storage Sequence
  Siemens defined AT commands for enhanced functions
  Command controls addressing of the logical SMS storage "MT".
- **AT^SLMS:** List Memory Storage
  Siemens defined AT command for enhanced functions
  This command lists the used and total storages for short messages
- **AT^SGCONF**: Configuration of GPRS parameters
  Siemens defined GPRS AT command
  Command allows to set GPRS parameters
- **AT^SGACT**: Query all PDP context activations
  Siemens defined GPRS command
  This command lists the activation states for all activated PDP contexts of the ME

4.2 List of jointly supported AT commands

All AT-commands listed in the tables below are supported by both MC35i and MC35. Default settings for command parameters, however, may be different.
NOTE: Many commands are available only after the PIN has been entered. For full list, please refer to respective AT reference manuals.

4.2.1 Standard V.25ter AT commands

Table 10*: Standard V.25ter AT commands*

#	AT	Command	
1	A/	Repeat previous command line	
2	+++	Switch from data mode or PPP online mode to command mode	
3	AT\Qn	Flow control	
	Differing parameter description		
	MC35 <n> 3 AT\Q3 RTS/CTS hardware flow control Required for the following procedures: incoming or outgoing data calls, fax calls, GPRS connections, CYCLIC SLEEP modes set with AT+CFUN. Often, the initialisation routine of Fax programs includes enabling RTS/CTS handshake, eliminating the need to issue AT\Q3 once again.	**MC35i** <n> AT\Q3 RTS/CTS hardware flow control Recommended for the following procedures: in-coming or outgoing data calls, fax calls, GPRS connections, MUX mode. Often, the initialisation routine of Fax programs includes enabling RTS/CTS handshake, eliminating the need to issue AT\Q3 once again	
4	ATA	Answer a call	
5	ATD	Mobile originated call to dial a number	
6	ATD><mem><n>	Originate call to phone number <n> in memory <mem>	
7	ATD><n>	Originate call to phone number selected from active memory	
8	ATD><str>	Originate call to phone number in memory with corresponding field	
9	ATDI	Mobile originated call to dialable ISDN number <n>	
10	ATDL	Redial last telephone number used	
11	ATE	Enable command echo	
12	ATH	Disconnect existing connection	
13	ATI	Display product identification information	
	Differing result code		
	MC35 SIEMENS **MC35** REVISION xx.yy OK	**MC35i** SIEMENS **MC35i** REVISION xx.yy OK	
14	ATI[value]	Display additional identification information	
	Differing result code		
	MC35 SIEMENS Gipsy Soft Protocolstack V2.550	**MC35i** SIEMENS Gipsy Soft Protocolstack V2.550	
15	ATL	Set monitor speaker loudness	
16	ATM	Set monitor speaker mode	
17	ATO	Switch from command mode to data mode / PPP online mode	
18	ATQ	Set result code presentation mode	
19	ATP	Select pulse dialing	
20	ATS0	Set number of rings before automatically answering the call	
21	ATS3	Write command line termination character	
	Additional note		
	MC35 N/A	**MC35i** Using other value than 13 can cause problems when entering commands	
22	ATS4	Set response formatting character	
23	ATS5	Write command line editing character	
24	ATS6	Set pause before blind dialling	
25	ATS7	Set number of seconds to wait for connection completion	

#	AT	Command	
26	ATS8	Set number of seconds to wait for comma dial modifier	
27	ATS10	Set disconnect delay after indicating the absence of data carrier	
28	ATS18	Extended error report	
29	ATT	Select tone dialling	
30	ATV	Set result code format mode	
31	ATX	Set CONNECT result code format and call monitoring	
32	ATZ	Set all current parameters to user defined profile	
	Additional note		
	MC35 N/A		**MC35i** If the user profile contains invalid settings for AT\Q, AT&S, AT&D or AT&C the corresponding values will be set to its factory default. Related chapters: AT&F in chapter 2.35, AT&W in chapter 2.38
33	AT&C	Set circuit Data Carrier Detect (DCD) function mode	
34	AT&D	Set circuit Data Terminal Ready (DTR) function mode	
	Additional note		
	MC35 N/A		**MC35i** Factory default is 2 if DTR is supported by the interface, otherwise 0.
35	AT&F	Set all current parameters to manufacturer defaults	
36	AT&S	Set circuit Data Set Ready (DSR) function mode	
37	AT&V	Display current configuration	
	Differing parameters		
	MC35 N/A		**MC35i** +CGSMS setting listed in all configurations (with or w/o PIN authentication, for all MUX channels)
38	AT&W	Store current configuration to user defined profile	
	Differing parameters		
	MC35 AT\Qn is NOT stored to user profile.		**MC35i** AT\Qn is stored to user profile.
39	AT+GCAP	Request complete TA capabilities list	
40	AT+GMI	Request manufacturer identification	
41	AT+GMM	Request TA model identification	
	Differing result code		
	MC35 **MC35** OK		**MC35i** **MC35i** OK
42	AT+GMR	Request TA revision identification of software status	
43	AT+GSN	Request TA serial number identification (IMEI)	
44	AT+ILRR	Set TE-TA local rate reporting	
	Differing parameters		
	MC35 N/A		**MC35i** Local data rate of 230400bps available.
45	AT+IPR	Set fixed local rate	
	Differing parameters		
	MC35 N/A		**MC35i** Fixed local data rate of 230400bps available.

4.2.2 AT commands for FAX

Table 11*: AT commands for FAX*

#	AT	Command
46	AT+FBADLIN	Bad Line Threshold
47	AT+FBADMUL	Error Threshold Multiplier
48	AT+FBOR	Query data bit order
49	AT+FCIG	Query or set the Local polling id
50	AT+FCLASS	Fax: Select, read or test service class
51	AT+FCQ	Copy Quality Checking
52	AT+FCR	Capability to receive
53	AT+FDCC	Query or set capabilities
54	AT+FDFFC	Data Compression Format Conversion
55	AT+FDIS	Query or set session parameter
56	AT+FDR	Begin or continue phase C data reception
57	AT+FDT	Data Transmission
58	AT+FET	End a page or document
59	AT+FK	Kill operation, orderly FAX abort
60	AT+FLID	Query or set the Local Id setting capabilities
61	AT+FMDL	Identify Product Mode
62	AT+FMFR	Request Manufacturer Identification
63	AT+FOPT	Set bit order independently
64	AT+FPHCTO	DTE Phase C Response Timeout
65	AT+FREV	Identify Product Revision
66	AT+FRH	Receive Data Using HDLC Framing
67	AT+FRM	Receive Data
68	AT+FRS	Receive Silence
69	AT+FTH	Transmit Data Using HDLC Framing
70	AT+FTM	Transmit Data
71	AT+FTS	Stop Transmission and Wait
72	AT+FVRFC	Vertical resolution format conversion

4.2.3 AT commands originating from GSM 07.07

Table 12*: AT commands from GSM 07.07*

#	AT	Command	
73	AT+CACM	Accumulated call meter (ACM) reset or query	
74	AT+CALA	Set alarm time	
75	AT+CAMM	Accumulated call meter maximum (ACMmax) set or query	
76	AT+CAOC	Advice of Charge information	
77	AT+CBST	Select bearer service type	
78	AT+CCFC	Call forwarding number and conditions control	
79	AT+CCLK	Real Time Clock	
80	AT+CCUG	Closed User Group	
81	AT+CCWA	Call waiting	
82	AT+CEER	Extended error report	
83	AT+CFUN	Set phone functionality	
	Additional parameters and notes		
	MC35 Two additional CYCLIC SLEEP modes: N/A Note: If SLEEP mode (<fun>=0, 5, or 6) is activated while a circuit-switched call is in progress, this call will immediately be terminated.		**MC35i** Two additional CYCLIC SLEEP modes available: 7 CYCLIC SLEEP mode: In this mode, the serial interface is shortly enabled during paging. If characters are recognized on the serial interface, the ME stays active for 2 seconds after the last character was sent or received. ME exits SLEEP mode only if AT+CFUN=1 is entered. 8 CYCLIC SLEEP mode: In this mode, the serial interface is shortly enabled during paging. If characters are recognized on the serial interface, the ME stays active for 10 minutes after the last character was sent or received. ME exits SLEEP mode only if AT+CFUN=1 is entered. Note: When a circuit-switched call is in progress, <fun>=7 or 8 can be activated without terminating the call. However, setting <fun>=0, 5 or 6 during a circuit-switched call immediately disconnects this call.
84	AT+CGMI	Request manufacturer identification	
85	AT+CGMM	Request model identification	
	Differing result codes		
	MC35 **MC35** OK		**MC35i** **MC35i** OK
86	AT+CGMR	Request revision identification of software status	
87	AT+CGSN	Request product serial number identification (IMEI) identical to GSN	
88	AT+CHLD	Call hold and multiparty	
89	AT+CHUP	Hang up call	
90	AT+CIMI	Request international mobile subscriber identity	
91	AT+CIND	Indicator control	
	Differing parameter implementation		

#	AT	Command	
	MC35 N/A		**MC35i** Additional "rssi" value available for <desc> parameter: Received signal (field) strength, scaled to value range 0…5, or 99 if not measurable. 0: signal strength < 112 dBm 1 - 4: signal strength in 15 dBm steps 5: signal strength > -51 dBm See also AT+CSQ in Chapter 4.46. Value range of AT+CSQ is 0 - 31.
92	AT+CLCC	List current calls of ME	
	Differing parameter implementation		
	MC35 N/A		**MC35i** <alpha> - alphanumeric representation in phonebooks: The maximum displayed length of <alpha> is 16 characters. If <alpha> has more than 16 characters, only the first 15 characters will be displayed. To indicate an overflow, a special character will be used for the 16th character: This will be a space if the character set selected with +CSCS is "GSM", or "E400" if the character set is "UCS2".
93	AT+CLCK	Facility lock	
	Differing parameters, wording of command syntax description and notes		
	MC35 Additional <fac> value: "CS" Keypad lock (not supported since keypad cannot be directly connected to the GSM engine).		**MC35i** N/A
94	AT+CLIP	Calling line identification presentation	
95	AT+CLIR	Calling line identification restriction	
96	AT+CLVL	Loudspeaker volume level	
97	AT+CMEE	Report mobile equipment error	
98	AT+CMER	Mobile equipment event reporting	
	Differing parameter **MC35i**		
	MC35 N/A		**MC35i** Additional "rssi" value available for <desc> parameter.
99	AT+CMUT	Mute control	
100	AT+CMUX	Enter multiplex mode	
101	AT+COPN	Read operator names	
102	AT+COPS	Operator selection	
103	AT+CPAS	Mobile equipment activity status	
104	AT+CPBR	Read current phonebook entries	
	Differing note		
	MC35 N/A		**MC35i** This command can be used only after the phonebook data from the SIM have been read successfully for the first time. Reading starts after successful SIM authentication has been performed, and may take up to 30 seconds depending on the SIM used. While the read process is in progress, an attempt to use any of the phonebook commands will result in "+CME Error: 14" (SIM busy).
105	AT+CPBS	Select phonebook memory storage	
106	AT+CPBW	Write phonebook entry	
107	AT+CPIN	Enter PIN	
108	AT+CPIN2	Enter PIN2	

#	AT	Command	
109	AT+CPUC	Price per unit and currency table	
110	AT+CPWD	Change password	
111	AT+CR	Service reporting control	
112	AT+CRC	Set Cellular Result Codes for incoming call indication	
113	AT+CREG	Network registration	
114	AT+CRLP	Select radio link protocol param. for orig. non-transparent data call	
115	AT+CRSM	Restricted SIM access	
116	AT+CSCS	Set TE character set	
117	AT+CSNS	Single Numbering Scheme	
118	AT+CSQ	Signal quality	
119	AT+CSSN	Supplementary service notification	
	Differing parameters		
	MC35 N/A		**MC35i** Note: The URCs will be displayed only if the call concerned is a voice call.
120	AT+CUSD	Unstructured supplementary service data	
121	AT+VTD=<n>	Tone duration	
122	AT+VTS	DTMF and tone generation (<Tone> in {0-9, *, #, A, B, C, D})	
123	AT+WS46	Select wireless network	

4.2.4 AT commands originating from GSM 07.05 for SMS

Table 13*: AT commands for SMS*

#	AT	Command	
124	AT+CMGC	Send an SMS command	
125	AT+CMGD	Delete SMS message	
126	AT+CMGF	Select SMS message format	
127	AT+CMGL	MC35 List SMS messages from preferred store	**MC35i** This command can be used only after the SMS data from the SIM have been read successfully for the first time. Reading starts after successful SIM authentication has been performed, and may take up to 30 seconds depending on the SIM used. While the read process is in progress, an attempt to use any of the phonebook commands will result in "+CME Error: 14" (SIM busy).
128	AT+CMGR	**MC35** Read SMS message	**MC35i** This command can be used only after the SMS data from the SIM have been read successfully for the first time. Reading starts after successful SIM authentication has been performed, and may take up to 30 seconds depending on the SIM used. While the read process is in progress, an attempt to use any of the phonebook commands will result in "+CME Error: 14" (SIM busy).
129	AT+CMGS	Send SMS message	
130	AT+CMGW	Write SMS message to memory	
131	AT+CMSS	Send SMS message from storage	
132	AT+CNMA	New SMS message acknowledge to ME/TE, only phase 2+	
133	AT+CNMI	New SMS message indications	
134	AT+CPMS	Preferred SMS message storage	
135	AT+CSCA	SMS service centre address	
136	AT+CSCB	Select cell broadcast message	
137	AT+CSDH	Show SMS text mode parameters	
138	AT+CSMP	Set SMS text mode parameter	
139	AT+CSMS	Select Message Service	

4.2.5 GPRS AT commands in accordance with GSM 07.07

Table 14*: GPRS AT commands*

#	AT	Command
140	AT+CGACT	PDP context activate or deactivate
141	AT+CGATT	GPRS attach and detach
142	AT+CGDATA	Enter data state
143	AT+CGDCONT	Define PDP Context
144	AT+CGQMIN	Quality of Service Profile (Minimum acceptable)
145	AT+CGQREQ	Quality of Service Profile (Requested)
146	AT+CGSMS	Select service for MO SMS messages
147	AT^SGAUTH	Set type of authentication for PPP connection
148	AT^SGACT	Query all PDP context activations
149	AT^SGCONF	Configuration of GPRS related parameters

#	AT	Command
150	ATD*99#	Request GPRS service
151	ATD*98#	Request GPRS IP service
152	ATH	Manual rejection of a network request for PDP context activation

4.2.6 AT commands for SIM Application Toolkit (GSM 11.14)

Table 15*: SIM Application Toolkit AT commands*

#	AT	Command	
153	AT^SSTA	Remote-SAT Interface Activation	
154	AT^SSTN	**MC35** Remote-SAT Notification	**MC35i** Remote-SAT Notification (Support of Proactive Command LAUNCH_BROWSER)
155	AT^SSTGI	**MC35** Remote-SAT Get Information	**MC35i** Remote-SAT Get Information (Support of Proactive Command LAUNCH_BROWSER)
156	AT^SSTR	**MC35** Remote-SAT Response	**MC35i** Remote-SAT Response (Support of Proactive Command LAUNCH_BROWSER)

4.2.7 Siemens defined AT commands for enhanced functions

Table 16*: Siemens defined AT commands*

#	AT	Command	
157	AT+CXXCID	Display card ID (identical to AT^SCID)	
158	AT^MONI	Monitor idle mode and dedicated mode	
	Differing parameters, implementation and syntax wording		
	MC35 PLMN only		**MC35i** PLMN is divided into MCC and MNC, differing statuses
159	AT^MONP	Monitor neighbour cell	
	Differing parameters		
	MC35 PLMN only		**MC35i** PLMN is divided into MCC and MNC
160	AT^SACM	Advice of charge and query of ACM and ACMmax	
161	AT^SBC	Battery charge and charger control	
	Differing parameters		
	MC35 <bcs> 0 No charging adapter is connected 1 Charging adapter is connected 2 Charging adapter is connected, charging in progress 3 Charging adapter is connected, charging has finished 4 Charging error, charging is interrupted 5 False charging temperature, charging is interrupted while temperature is beyond allowed range <bcl> Battery capacity 0, 20, 40, 60, 80, 100 percent of remaining capacity (6 steps) 0 indicates that either the battery is exhausted or the capacity value is not available <mpc> Average power consumption: Value (0...5000) of average power consumption (mean value over a couple of seconds) in mA. See read and write command for details.		**MC35i** Feature not supported – not relevant to **MC35i** <bcs> Connection status of charging adapter. Not relevant for **MC35i**. 0 No charging adapter is connected. <bcl> Battery capacity. Not relevant for **MC35i**. 0 Indicates that no battery is available. <mpc> Average power consumption. 0 - 5000 ME's power consumption in mA averaged over a couple of seconds.

#	AT	Command	
162	AT^SCID	Display SIM card identification number	
163	AT^SCKS	Set SIM connection presentation mode and query SIM connection status	
164	AT^SCNI	List Call Number Information	
165	AT^SCTM	Set critical operating temperature presentation mode or query temperature	
	Additional parameter and different syntax wording		
	MC35 <temp> not available.		**MC35i** <temp> Current board temperature in Celsius. The value is comprised between lowest and upper temperature limits.
166	AT^SDLD	Delete the 'last number redial' memory	
168	AT^SHOM	Display Homezone	
169	AT^SLCD	Display Last Call Duration	
170	AT^SLCK	Facility lock	
172	AT^SM20	Set M20 Compatibility	
173	AT^SMGL	**MC35** List SMS messages from preferred storage	**MC35i** This command can be used only after the SMS data from the SIM have been read successfully for the first time. Reading starts after successful SIM authentication has been performed, and may take up to 30 seconds depending on the SIM used. While the read process is in progress, an attempt to use any of the phonebook commands will result in "+CME Error: 14" (SIM busy).
174	AT^SMGO	Set or query SMS overflow presentation mode or query SMS overflow	
177	AT^SMSO	Switch off mobile station	
178	AT^SMGR	**MC35** Read SMS message without set to REC READ	**MC35i** This command can be used only after the SMS data from the SIM have been read successfully for the first time. Reading starts after successful SIM authentication has been performed, and may take up to 30 seconds depending on the SIM used. While the read process is in progress, an attempt to use any of the phonebook commands will result in "+CME Error: 14" (SIM busy).
179	AT^SNFA	Set or query microphone attenuation	
180	AT^SNFD	Set audio parameters to manufacturer default value	
181	AT^SNFI	Set microphone path parameters	
182	AT^SNFM	Mute microphone	
183	AT^SNFO	Set audio output (= loudspeaker path) parameter	
184	AT^SNFPT	Call progress tones	
185	AT^SNFS	Select audio hardware set	
186	AT^SNFV	Set loudspeaker volume	
187	AT^SNFW	Write audio setting in non-volatile store	
	Differing parameters and implementation		
	MC35 - Saved parameters: <inBbcGain>, <inCalibrate>, <outBbcGain>, <outCalibrate[0]> ... <outCalibrate[4]>, <sideTone>		**MC35i** - The audio profile saved with AT^SNFW includes the following parameters: AT^SNFI: <inBbcGain>, <inCalibrate> (or the equivalent AT^SNFA parameters) AT^SNFO: <outBbcGain>, <outCalibrate[0]> ... <outCalibrate[4]>, <side Tone> AT^SAIC: <io>,<mic>,<ep>
188	AT^SPBC	Search the first entry in the sorted telephone book	
190	AT^SPBG	Read entry from active telephone book via sorted index	
191	AT^SPBS	Steps the selected phonebook alphabetically	

#	AT	Command	
192	AT^SPIC	Display PIN counter	
193	AT^SPLM	Read the PLMN list	
194	AT^SPLR	Read entry from the preferred operators list	
195	AT^SPLW	Write an entry to the preferred operators list	
	Minor differences in implementation		
	MC35		**MC35i**
	TA writes an entry to the SIM list of preferred operators at location number <index>. If <index> is given but <oper> is left out, the entry is deleted. If <oper> is given but <index> is left out, <oper> is inserted in the next free location		TA writes an entry to the SIM list of preferred operators at location number <index>. If <index> is given but <oper> is left out, the entry is deleted.
196	AT^SPWD	Change password for a lock	
197	AT^SRTC	Select, query, test ring tone parameter	
	Additional parameter, differences in wording of command syntax description		
	MC35		**MC35i** Test command AT^SRTC=? Response ^SRTC: (list of supported <type>s), (list of supported <vol>s), (list ofsupported <event>s) OK Read command AT^SRTC? Response ^SRTC: <type> of event=0, <vol> of event=0, <type> of event=1, <vol> of event=1,<stat>OK Write command AT^SRTC=[<type>][,<vol>] [,<event>] Response ^SRTC: <type>, <vol>,<event> OK New parameter: <event> Event to be indicated. All settings of <type> and <vol> apply to the selected event only. 0 All MTCs (voice, data etc.) 1 Incoming short message.
198	AT^SSCONF	SMS Configuration	
199	AT^SSDA	Set Display Availability	
201	AT^SSYNC	Configure SYNC Pin	
202	AT^STCD	Display Total Call Duration	

4.3 List of new AT-Commands

New commands - supported exclusively by MC35i.

4.3.1 GPRS AT commands

Table 17*: New GPRS AT commands*

#	AT	Command
144	AT+CGPADDR	Show PDP address
147	AT+CGREG	GPRS network registration status

4.3.2 Siemens defined AT commands for enhanced functions

Table 18*: New Siemens defined AT commands*

#	AT	Command
161	AT^SAIC	Audio Interface Configuration
169	AT^SGACT	Query all PDP context activation
173	AT^SLMS	List Memory Storage
177	AT^SMONC	Cell Monitoring
178	AT^SMONG	GPRS Monitor
191	AT^SPBD	Delete the given Phonebook
202	AT^SSMSS	Set Short Message Storage Sequence

4.4 List of unsupported AT-Commands

MC35i supports the entire MC35 AT command set.

4.5 List of AT-Commands for V.25ter compatibility

These commands return "OK" but have no functionality in both MC35 and MC35i.

Table 19*: V.25ter compatibility commands*

#	AT	Command
1	ATL	Set monitor speaker loudness
2	ATM	Set monitor speaker mode
3	ATP	Select pulse dialing
4	ATS1	READ-ONLY, INTERNAL USAGE
5	ATS2	Escape code sequence
6	ATS6	Set pause before blind dialing
7	ATS8	Set number of seconds to wait for comma dial modifier
8	ATS9	READ-ONLY, INTERNAL USAGE
9	ATS11-ATS17	READ-ONLY, INTERNAL USAGE
10	ATS19-ATS29	READ-ONLY, INTERNAL USAGE
11	ATT	Select tone dialing